809 METAL PIPE AND FITTINGS

809.01 DUCTILE IRON PIPE AND FITTINGS.

(A) DUCTILE IRON PIPE. Ductile iron pipe and outside asphaltic coating shall be per AWWA C 151 and cement lined per AWWA C 104, except that pipe for bridge deck drainage shall not be cement lined and shall not be coated.

Wall thickness class shall be per Table 809-1 unless otherwise specified on Contract Drawings.

Table 809-1

Diameter Inches	Rated Working Pressure	Thickness Class
6	350	52
8	350	52
12	350	52
16	350	51
20	350	51
24	300	51
30	200	50
36	200	50
42	200	50
48	200	50

(B) JOINTS AND FITTINGS - DUCTILE IRON PIPE.

(1) Mechanical and push-on joints for ductile iron water main pipe shall be per AWWA C 111.

(2) Ductile iron fittings and outside asphaltic coating shall be per AWWA C 110, including dimensions and weights. Pressure rating shall be same as that of pipe it connects, per Table 809-1. All fittings, except ductile iron sleeves and sleeve couplings, shall be cement mortar lined per AWWA C 104. All fittings shall be complete with all joint accessories, rubber gaskets, bolts and nuts.

(C) JOINT RESTRAINT, DUCTILE IRON PIPE. Ductile iron retainer glands for joint restraint of mechanical joint, ductile iron pipe 24-inches diameter and smaller shall be per AWWA C 111 and ASTM A 536 for follower glands that include a restraining mechanism of size and arrangement per manufacturer's recommendations, of the following type:

(1) Ductile iron wedges in combination with special, heat treated set screws with or without twist-off nuts and torqued per manufacturer's recommendations; or

(2) Hardened steel set screws with knurled and cupped points, with or without twist-off nuts, and torqued per manufacturer's recommendation.

Retainer glands shall meet working pressure rating for push- on joints per AWWA C 111, except 20-inch diameter gland shall meet working pressure rating of 250 psi.

Harness for joint restraint of push-on joint, ductile iron pipe 30-inch and larger diameter shall be Lok-Fast and Lock-Ring harness by American Cast-Iron or TR Flex harness by U.S. Pipe and Foundry or approved equivalent restraint.

Where specifically indicated, undrilled steel thrust collars with concrete thrust blocks, drilled steel thrust collars with harnessing, or steel tie rods threaded through joint flanges shall be used to provide thrust force restraint. Collars, rods and other steel harness items shall be per manufacturer's recommendations and approved by the Engineer. Concrete thrust blocks shall be Class 3000 minimum.

When shown in the contract drawings, pipe, fittings, and valves shall be restrained by concrete thrust blocks per 322. If applicable, steel H piles per 301 shall be furnished and installed.

(D) SLEEVE COUPLINGS. Couplings shall be designed for the specified operating and test procedures of the lines in which they were used. Couplings shall be of a gasketed, sleeve-type with diameter to properly fit the pipe. Each coupling shall consist of one steel middle ring or sleeve, of thickness and length specified, two (2) steel followers, two (2) rubber-compounded wedge section gaskets and sufficient track-head steel bolts to properly compress the gaskets.

Middle ring or sleeve shall be per ASTM A 53, Type E or S, or ASTM A 512 or A 513 meeting 35,000 psi minimum yield strength. Ring shall be furnished without pipe stop.

Followers shall be per ASTM A 715, Grade 80 or equivalent steel with 80,000 psi minimum yield strength.

Gaskets shall be grade 27, Buna S blend rubber or approved
equivalent, designed for sleeve couplings. Gaskets shall be compounded to produce a material which will not deteriorate from age, from heat, or exposure to air under normal storage conditions. Gaskets shall possess the quality of resilience and ability to resist cold flow of the material so that the joint will remain sealed and tight indefinitely when subjected to shock, vibration, pulsation and temperature or other adjustment of the pipe line.

Coupling bolts shall be of the elliptic-neck, track-head design with rolled threads. Bolts shall be steel meeting 35,000 psi minimum yield strength, accompanied with equivalent strength nuts. Bolts and nuts shall have a protective coating per AWWA C 203 and C 104.

Middle ring and followers shall be true circular sections free from irregularities, flat spots or surface defects. They shall be formed with the follower-ring section of such design as to provide confinement of the gasket. All bolt holes in the followers shall be oval for greater strength. After welding, they shall be tested by cold expanding a minimum of one percent (1) beyond the yield point.

Harness tie rods shall have properties equivalent to ASTM A 307, Grade B. Nuts shall be per AASHTO M291, Grade D.

Surfaces of sleeve couplings and other steel coupling parts shall be given shop applied cold primer and wrapped with coal-tar tape per AWWA C 203, Section 3. Coating manufacturer shall certify primer and tape meet AWWA C 203, Section 3 requirements.

Couplings shall be Style 38, manufactured by Dresser Manufacturing Company; No. 411, manufactured by Rockwell International; or approved equivalent.

(E) BOSSES - DUCTILE IRON PIPE (30-INCH AND LARGER DIAMETER WATER MAIN). A boss connection shall be utilized only where indicated in the contract drawings.

Bosses shall be either ductile iron, 60-42-10 grade, or mild to medium grade carbon-steel castings, per AASHTO M103.

Pipe sections selected to receive welded-on bossed outlets shall be ferritic grade ductile iron per the following:

(1) Minimum Charpy impact test of 10 ft.-lbs. per ASTM E 23 and AWWA C 151.

(2) Minimum thickness Class 51.

Bosses shall be shop welded to ductile iron pipe by certified pipe manufacturer's welders only, using nickel-iron electrodes such as Ni-Rod FC55 Cored Wire products by Huntington Alloy, Inc., Huntington, West Virginia or approved equivalent. Field welding of bossed outlets is prohibited.

All completed welds shall be tested at pipe plant using the "Liquid Dye Penetrant Test Method" to insure integrity of welds.

Bosses shall be furnished, drilled and tapped for AWWA C 111 mechanical joint connections unless otherwise specified.

Shop applied double protective coating system for bossed outlets shall be:

(1) Koppers' Splash Zone compound (A-788-66) or equivalent around and overlapping weld area, and on the interior of the boss-pipe junction, to form an epoxy fillet over the weld and provide a smooth transition between boss and parent pipe; and

(2) Koppers' Petropoxy (asphalt epoxy) or equivalent coating approximately ten mils thick on entire interior and exterior of boss area, coating fillets and pipe surfaces surrounding the welded outlets.

Bossed outlets shall be rated at the same pressure as the main pipe but not less than 250 psi with a safety factor of 2.0. Certified results of hydrostatic tests on each bossed outlet shall be submitted to the Engineer prior to delivery.

Minor damage to pipe cement lining and coating shall be repaired at pipe plant to meet AWWA C 104.

Bossed outlets by U.S. Pipe Company or American Cast- Iron Pipe Company are conditionally acceptable.

(F) 2-INCH BLOWOFF VALVES. Two-inch hand wheel gate valves (wheel valves) shall be iron body, bronze mounted, double disc, parallel seat, non-rising stem type with threaded ends and handwheel operator, 200 psi working pressure. Rotation of handwheel to open shall be clockwise.

(G) COATING/LINING FOR STEEL CONNECTIONS. Exterior coating/interior lining for sleeve couplings and other steel connection pieces shall be per AWWA C 203 and AWWA C 104.

(H) MATERIALS SUPPLIED BY DISTRICT. Corporation stops for dead end and air blowoffs 2-inches and smaller in diameter will be furnished by the District at no cost to the Contractor.

809.02 CORRUGATED METAL CULVERT PIPE AND PIPE UNDERDRAIN

Corrugated metal culvert pipe shall meet the requirements of AASHTO M 36, for the Type, Class, base metal and gage as specified in the Contract.

Corrugated metal pipe underdrain shall meet the requirements of AASHTO M 36, Type III and Class as specified.

809.03 CAST IRON PIPE

Cast iron pipe and fittings shall meet requirements of ASTM A 74, Extra Heavy type.

809.04 STEEL PIPE

Steel pipe shall meet the requirements of ASTM A 53 for the Type and Grade specified.

809.05 COPPER TUBE

Seamless copper water tube shall meet requirements of ASTM B 88, Type K wall.

(A) SEAMLESS COPPER PIPE. Seamless copper pipe shall meet the requirements of ANSI H26.1, ASTM B 42, FS WW-P-377d, or ASME SB-42.

(B) THREADLESS COPPER PIPE. Threadless copper pipe shall meet the requirements of ANSI H26.2 or ASTM B 302.

(C) SEAMLESS COPPER TUBE. Seamless copper tube shall meet the requirements of ANSI H23.3, ASTM B 75, or FS WW-T-797c.

(D) COPPER DRAINAGE TUBE, TYPE DWV. Copper drainage tube, Type DWV shall meet the requirements of ANSI H23.6, ASTM B 306, or CS 229-60.

(E) SEAMLESS COPPER WATER TUBE. Copper water tube, Types K, L, and M shall meet the requirements of ANSI H23.1, ASTM B 88, FS WW-T-799b-1970, or FS WW-T-799b-1963.